WHAT IS CLAIMED IS:

1. A process for preparing an aligning substrate for liquid crystals, comprising the steps of:

providing an aligning substrate comprising an aligning film; and

bombarding at least a portion of the substrate with a plasma beam from a plasma beam source at an incident angle of greater than 0° to about 80° to produce an aligning direction on the aligning substrate.

2. The process according to claim 1, wherein the plasma beam source is a closed drift thruster.

3. The process according to claim 2, wherein current density of the plasma beam is about 0.1 to about 1000 $\mu A/cm^2$, and wherein the ion energy is from about 100 to about 5000 eV.

4. The process according to claim 3, wherein the bombarded portion of the aligning substrate imparts to a liquid crystal an alignment direction having an azimuth angle φ of about 0° and a zenithal angle θ of 0° to about 40°, or an azimuth angle φ of about 90° and a zenithal angle θ of about 0°.

5. The process according to claim 3, wherein said controlled drift thruster is an anode layer thruster.

6. The process according to claim 3, wherein the aligning film comprises polyvinyl cinnimate, unsaturated polyester, polyimide, poly(meth)acrylate, polyvinyl acetate, glass, quartz, gold, indium tin oxide, silicon, silicon oxide, hydrogenated diamond-like carbon, or hydrogenated amorphous silicon.

7. The process according to claim 6, wherein the bombarded portion of the aligning substrate imparts an alignment mode having an azimuth angle φ of about

0° and a zenithal angle θ of 0° to about 40°, or an azimuth angle φ of about 90° and a zenithal angle θ of about 0°.

8. The process according to claim 6, wherein current density of the plasma beam is about 0.5 to about 30 μA/cm², and wherein the ion energy is from about 200 to about 700 eV.

9. The process according to claim 3, wherein the incident angle is about 20° to about 75°.

10. The process according to claim 9, wherein the incident angle is about 50° to about 75°.

11. The process according to claim 2, further including a step of forming a liquid crystal cell comprising the aligning substrate and thermotropic or lyotropic liquid crystals.

12. The process according to claim 4, further including a step of forming a liquid crystal cell comprising the aligning substrate and thermotropic or lyotropic liquid crystals.

13. The process according to claim 2, further including a step of utilizing a mask to prevent the plasma beam from reaching a predetermined portion of the aligning substrate.

14. The process according to claim 6, further including a step of utilizing a mask to prevent the plasma beam from reaching a predetermined portion of the aligning substrate.

15. The process according to claim 2, wherein the plasma beam is in the form of a sheet.

16. The process according to claim 6, wherein the plasma beam is in the form of a sheet.

17. The process according to claim 2, further including the step of moving the aligning substrate through a path of the plasma beam.

18. The process according to claim 4, further including the step of moving the aligning substrate through a path of the plasma beam.

19. The process according to claim 6, further including the step of moving the aligning substrate through a path of the plasma beam.

20. The process according to claim 1, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

21. The process according to claim 4, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

22. The process according to claim 6, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

23. A method for generating an alignment direction on an aligning substrate for liquid crystal cells, comprising the steps of:

directing a plasma beam from a closed drift thruster at at least one area of an aligning substrate at an incident angle of greater than 0° normal to the substrate to about 85° at a current density and ion energy for a predetermined amount of time to provide a mode of alignment for liquid crystals.

24. The method according to claim 23, wherein the aligning substrate comprises an organic or inorganic aligning composition.

25. The method according to claim 24, wherein a current density of the plasma beam is about 0.1 to about 1000 $\mu A/cm^2$, and wherein the ion energy is from about 100 to about 2000 eV.

26. The method according to claim 25, wherein the area of the substrate irradiated by the plasma beam imparts an alignment mode having an azimuth angle φ of about 0° and a zenithal angle θ of 0° to about 40°, or an azimuth angle φ of about 90° and a zenithal angle θ of about 0°.

27. The method according to claim 26, wherein said controlled drift thruster is an anode layer thruster.

28. The method according to claim 25, wherein the aligning film comprises polyvinyl cinnimate, unsaturated polyester, a polyimide, poly(meth)acrylate, polyvinyl acetate, glass, quartz, gold, indium tin oxide, silicon, silicon oxide, hydrogenated diamond-like carbon, or hydrogenated amorphous silicon.

29. The method according to claim 28, wherein the bombarded portion of the substrate imparts an alignment mode having an azimuth angle φ of about 0° and a zenithal angle θ of 0° to about 40°, or an azimuth angle φ of about 90° and a zenithal angle θ of about 0°.

30. The method according to claim 29, wherein current density of the plasma beam is about 0.5 to about 30 $\mu A/cm^2$, and wherein the ion energy is from about 200 to about 700 eV.

31. The method according to claim 25, wherein the incident angle is about 20° to about 75°.

32. The method according to claim 30, wherein the incident angle is about 50° to about 75°.

33. The method according to claim 23, further including a step of forming a liquid crystal cell comprising the aligning substrate and thermotropic or lyotropic liquid crystals.

34. The method according to claim 27, further including a step of forming a liquid crystal cell comprising the aligning substrate and thermotropic or lyotropic liquid crystals.

35. The method according to claim 23, further including a step of utilizing a mask to prevent the plasma beam from reaching a predetermined portion of the aligning substrate.

36. The method according to claim 27, further including a step of utilizing a mask to prevent the plasma beam from reaching a predetermined portion of the aligning substrate.

37. The method according to claim 23, wherein the plasma beam is in the form of a sheet.

38. The method according to claim 27, wherein the plasma beam is in the form of a sheet.

39. The method according to claim 23, further including the step of moving the aligning substrate through a path of the plasma beam.

40. The method according to claim 27, further including the step of moving the aligning substrate through a path of the plasma beam.

41. The method according to claim 30, further including the step of moving the aligning substrate through a path of the plasma beam.

42. The method according to claim 23, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

43. The method according to claim 27, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

44. The method according to claim 30, wherein the aligning substrate is positioned at a distance of about 5 to about 50 cm from the plasma beam source.

45. A method for generating an alignment direction on an aligning substrate for liquid crystal cells, comprising the steps of:

directing a plasma beam from a closed drift thruster at at least one area of an aligning substrate at an incident angle normal to the substrate to about 80° at a current density and ion energy for a predetermined amount of time to provide a substantially homeotropic mode of alignment for liquid crystals.

46. The method according to claim 45, wherein the current density of the plasma beam is about 0.1 to about 1000 $\mu A/cm^2$, and wherein the ion energy is from about 100 to about 2000 eV.

47. The method according to claim 45, wherein said controlled drift thruster is an anode layer thruster.

48. The method according to claim 47, wherein the aligning film comprises polyvinyl cinnimate, unsaturated polyester, a polyimide, poly(meth)acrylate, polyvinyl acetate, glass, quartz, gold, indium tin oxide, silicon, silicon oxide, hydrogenated diamond-like carbon, or hydrogenated amorphous silicon.

49. The method according to claim 48, further including a step of forming a liquid crystal cell comprising the aligning substrate and thermotropic or lyotropic liquid crystals.

50. The method according to claim 48, further including the step of moving the aligning substrate through a path of the plasma beam.